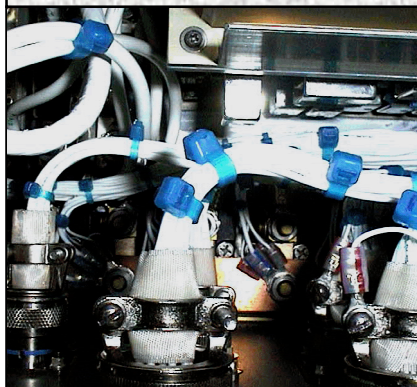
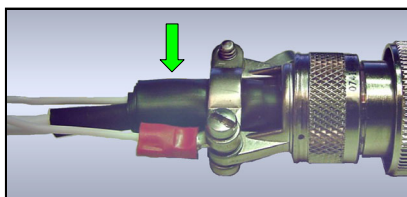


## CABLE AND HARNESS GENERAL REQUIREMENTS



### CABLE AND HARNESS GENERAL REQUIREMENTS

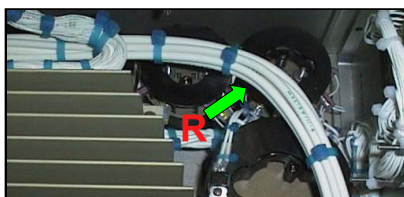
Often the most overlooked and ignored component of any electrical / electronic design, cables and harnesses are essential to the accurate and rapid transmission of data and control signals.



#### PREFERRED BACKSHELL

Connector backshells shall be potted and molded, or use stress relief boots as required, in accordance with applicable engineering documentation.

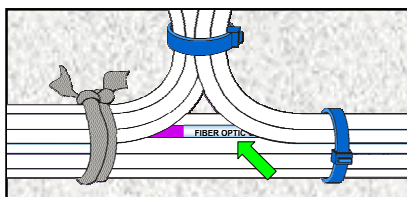
[NASA-STD-8739.4 \[ 13.1.1.c \]](#)



#### PREFERRED BEND RADIUS

Cables and harnesses shall not be subjected to bending forces resulting in radii less than the minimum specified for the most sensitive component (i.e.: coaxial, fiber, etc.) in the assembly.

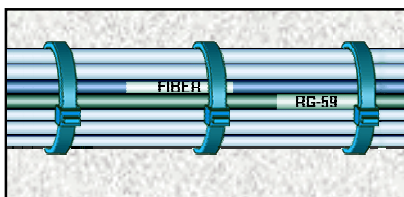
[Best Workmanship Practice](#)



#### PREFERRED COAXIAL / FIBER OPTIC CABLE LOCATION

Harnesses should be designed so that coaxial / fiber optic cables are located at or near the bundle center to minimize flexure, and to provide additional protection.

[Best Workmanship Practice](#)



#### PREFERRED COAXIAL / FIBER OPTIC CABLES

Coaxial cables (flexible, semi-rigid, rigid) and fiber optic cables shall exhibit a neatly organized layout, with smooth bends and sufficient stress relief.

[Best Workmanship Practice](#)

## NASA WORKMANSHIP STANDARDS



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Revision:

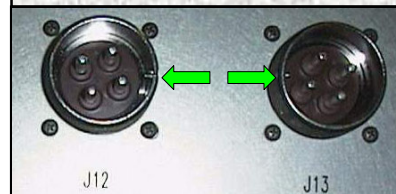
Revision Date:

Book:  
4

Section:  
4.01

Page:  
1

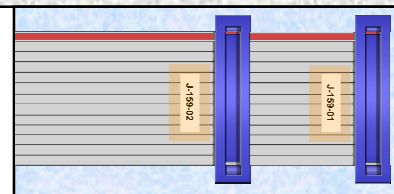
## CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)



#### PREFERRED POLARIZATION / KEYING

Interconnecting cables and harnesses shall be designed with physical constraints (keying, sizing, polarization, etc.) to prevent incorrect mating / interchanging with similar sized / colored connectors.

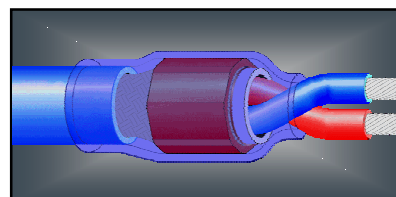
[NASA-STD-8739.4 \[ 7.1 \]](#)



#### PREFERRED RIBBON CABLE

The cable assembly meets dimensional, layout, and design requirements and exhibits a smooth, flat profile, with no visible damage to the connectors or the insulation. Connectors are properly aligned and seated.

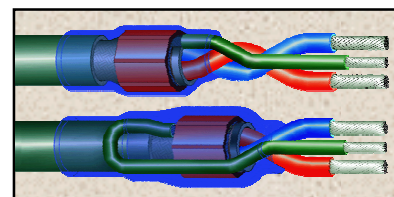
[Best Workmanship Practice](#)



#### PREFERRED SHIELD TERMINATION - FLOATING

Heat shrink tubing is properly installed, tightly shrunk, and the termination is visible. Overlaps are of sufficient length to meet minimum electrical spacing.

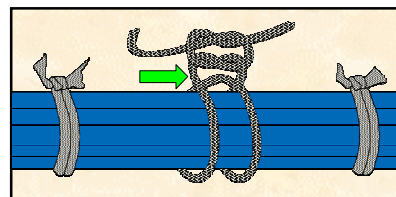
[NASA-STD-8739.4 \[ 9.8.1 \], \[ 9.9 \], \[ 11.5 \], \[ 19.6.1 \]](#)



#### PREFERRED SHIELD TERMINATION - GROUNDED

Heat shrink sections are properly installed, tightly shrunk, and the termination is visible. Overlaps meet minimum electrical spacing. Ground wire exhibits proper bend radius and strain relief.

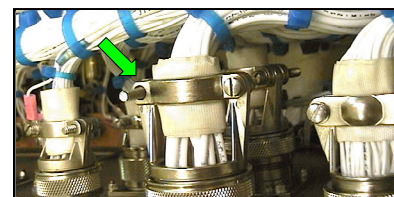
[NASA-STD-8739.4 \[ 7.3.22 \], \[ 9.8.1 \], \[ 9.9 \], \[ 11.5 \], \[ 19.6.1 \]](#)



#### ACCEPTABLE SPOT TIES

Spot ties shall consist of a clove hitch, followed by a square or other similar non-slip knot (i.e.: surgeon, etc.).

[NASA-STD-8739.4 \[ 9.2.2 \]](#)



#### ACCEPTABLE BACKSHELL ASSEMBLY

Connector backshells, adapters, and clamps shall be assembled and torqued per engineering documentation.

[NASA-STD-8739.4 \[ 13.5 \]](#)

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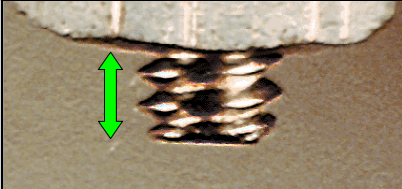
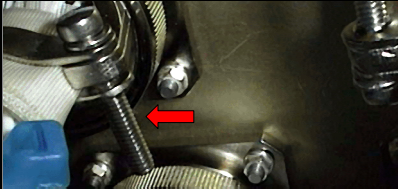
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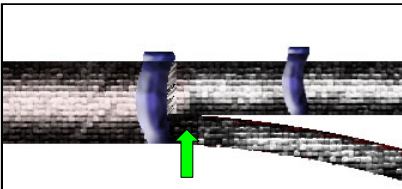
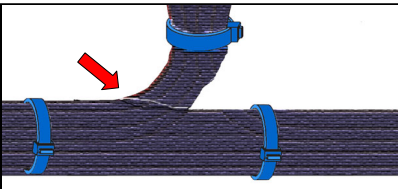
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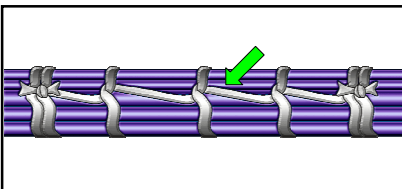
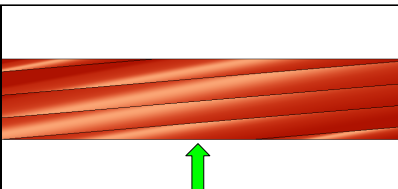
Book:  
4


Section:  
4.01

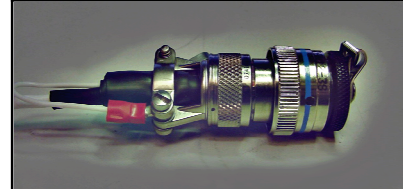
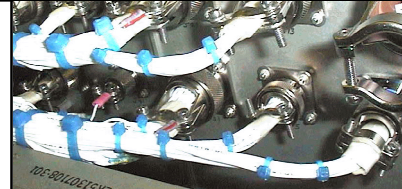
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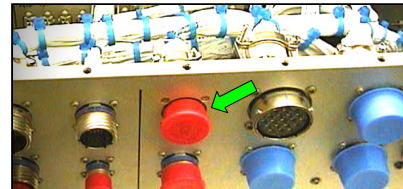
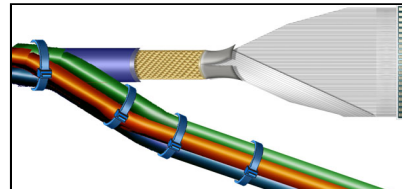
CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>ACCEPTABLE BACKSHELL SCREW PROTRUSION</b></p> <p>Screws shall protrude a minimum of 1-1/2 threads beyond the threaded hardware (e.g., nut, clamp, etc.), but shall not violate minimum electrical spacing or snag requirements, unless otherwise specified by engineering documentation.</p> <p><a href="#">Best Workmanship Practice</a></p>	<p><b>UNACCEPTABLE EXCESSIVE THREAD PROTRUSION</b></p> <p>Excess thread protrusion represents an assembly, interference, and electrical separation problem, as well as adds unnecessary weight to the assembly.</p> <p><a href="#">Best Workmanship Practice</a></p>

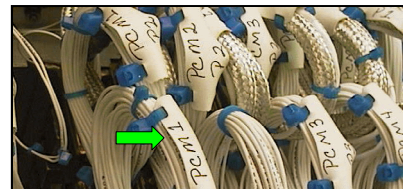
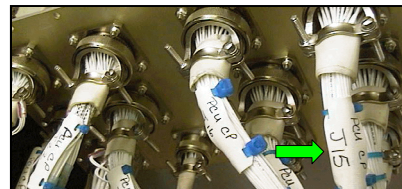
	
<p><b>ACCEPTABLE BREAKOUT DRESS W/ FABRIC BRAID</b></p> <p>Braiding shall be dressed to form a smooth profile across the breakout. Braiding shall not be split, slit, or punctured to provide a breakout opening.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3 ]</a></p>	<p><b>UNACCEPTABLE SPLIT / SLIT BRAIDING AT BREAKOUT</b></p> <p>Braiding shall not be split, slip, or punctured to provide an opening at the breakout.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3 ]</a></p>


	
<p><b>ACCEPTABLE CABLE LACING RUNNING STITCH</b></p> <p>The lacing begins and ends with a knot. Wraps are properly spaced (relative to harness diameter) to maintain the wiring in a tight, neat bundle. Ends are properly trimmed.</p> <p><a href="#">NASA-STD-8739.4 [ 9.2 ]</a></p>	<p><b>ACCEPTABLE CABLE LAYUP</b></p> <p>Cables containing discrete conductors shall be fabricated in one or more layers, by winding the conductors together uniformly. Layup (twist) of each layer shall be 8-16 times the outer harness diameter.</p> <p><a href="#">NASA-STD-8739.4 [ 7.3.20 ], [ 19.6.1.e.4 ]</a></p>

NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 04.05.2002	Revision: Revision Date:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 4	Section: 4.01 Page: 4

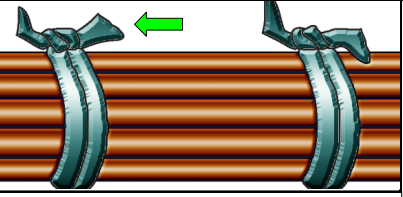

CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>PREFERRED CONNECTOR STYLE</b></p> <p>Connectors shall be straight, right-angle, or flange-mount. The use of right-angle connectors shall be minimized and restricted to applications where stress-free mounting of the cable assembly can be assured.</p> <p><a href="#">Best Workmanship Practice</a></p>	<p><b>PREFERRED DISCRETE WIRE HARNESSES</b></p> <p>Harnesses exhibit a neatly organized layout, with smooth bends and sufficient stress relief. Connector cable clamps and cable straps are properly set.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.1.e ]</a></p>

	
<p><b>PREFERRED DUST CAPS</b></p> <p>The mating surfaces of all unmated connectors shall be protected by covers during storage, handling, and installation. Connectors on ESD sensitive hardware shall be protected by ESD rated dust caps / covers.</p> <p><a href="#">NASA-STD-8739.4 [ 13.1.2 ], [ 16.2.4 ], [ 16.3.3 ]</a></p>	<p><b>PREFERRED HYBRID CABLES / HARNESSES</b></p> <p>Hybrid cables / harnesses (copper / fiber optic / coaxial conductors) shall be designed to comply with the requirements of the most sensitive and demanding component (typically the fiber optic cable) in the assembly.</p> <p><a href="#">Best Workmanship Practice</a></p>

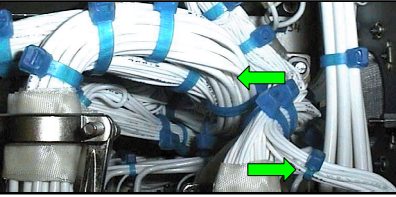
	
<p><b>PREFERRED IDENTIFICATION CABLES / HARNESSES</b></p> <p>Each cable / harness shall be identified by a permanent label / marking.</p> <p><a href="#">NASA-STD-8739.4 [ 14.2.1 ]</a></p>	<p><b>PREFERRED IDENTIFICATION CONNECTOR</b></p> <p>Each connector shall be identified by a permanent label / marking affixed directly to the connector body, or to the cable adjacent to the connector.</p> <p><a href="#">NASA-STD-8739.4 [ 14.2.2 ]</a></p>

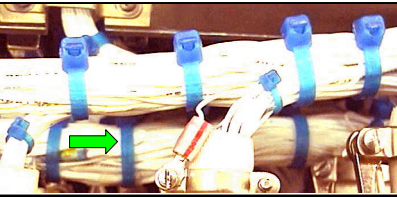
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	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 04.05.2002	Revision: Revision Date:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 4	Section: 4.01 Page: 2

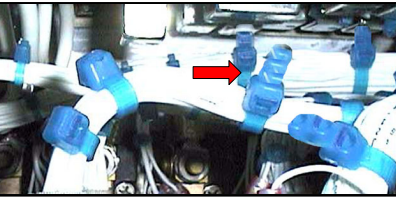



CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>ACCEPTABLE CABLE LACING SPOT TIES</b></p> <p>Ties are neat, tight, and properly spaced (relative to harness diameter) to maintain the wiring in a tight, neat bundle. Ends are properly trimmed.</p> <p><a href="#">NASA-STD-8739.4 [ 9.2.2 ]</a></p>	<p><b>UNACCEPTABLE LOOSE CABLE LACING</b></p> <p>The lacing has not been properly installed, resulting in a loose, unorganized bundle.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.d.4 ]</a></p>

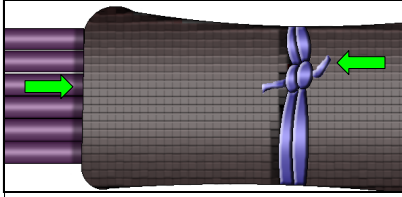
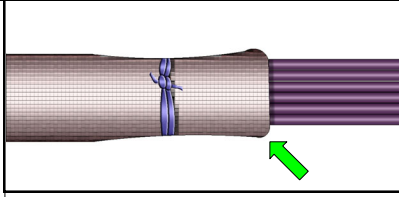

<p><b>ACCEPTABLE CABLE STRAPS / TIES</b></p> <p>Plastic straps should have metal tangs that lock securely into the ribbed portion of the strap.</p> <p><a href="#">NASA-STD-8739.4 [ 7.3.4 ]</a></p>

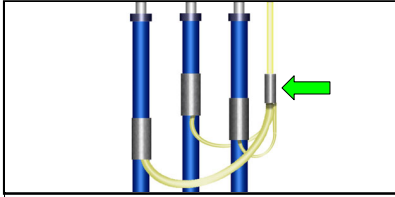

<p><b>ACCEPTABLE CONDUCTOR DRESS</b></p> <p>All wires are dressed with even bends and sufficient strain relief. Conductor crossover is minimized.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.1.e ]</a></p>

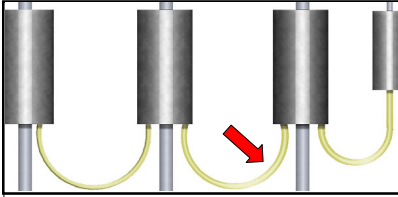

<p><b>ACCEPTABLE CABLE TIES / TIE WRAPS</b></p> <p>The cable ties / tie wraps are sufficiently tight to prevent lateral movement along the cable bundle under normal handling, but can be rotated in place. Strap ends have been trimmed off square and flush with the face of strap head.</p> <p><a href="#">NASA-STD-8739.4 [ 9.6 ]</a></p>

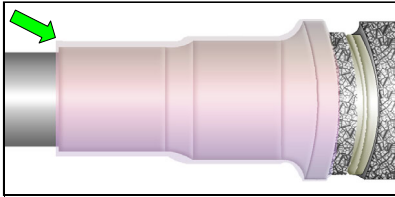

<p><b>UNACCEPTABLE UNTRIMMED CABLE TIES</b></p> <p>The strap end shall be trimmed off, flush with the back end of the strap head.</p> <p><a href="#">NASA-STD-8739.4 [ 9.6 ], [ 19.6.2.d.5 ]</a></p>

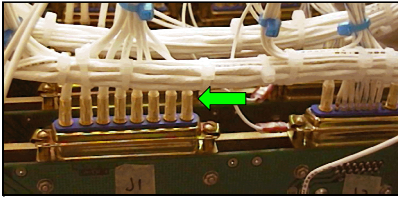
NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 04.05.2002	Revision:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 4	Section: 4.01
		Revision Date:	Page: 5


CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>ACCEPTABLE FABRIC BRAID SLEEVING BASIC END TERMINATION</b></p> <p>The end of the braid shall be tucked under and secured with a spot tie or plastic strap.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3.1 ]</a></p>	<p><b>ACCEPTABLE GLASS BRAID SLEEVING</b></p> <p>The ends of glass braid may be bonded by use of adhesive, and then secured by spot tie, or other means, to prevent movement on the wire bundle.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3.3 ]</a></p>

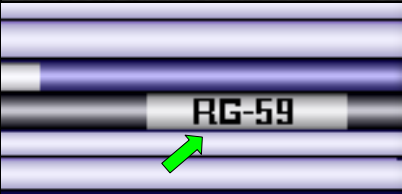
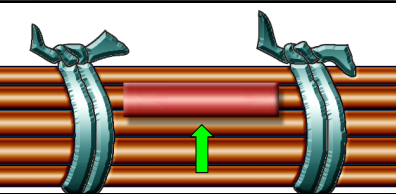

<p><b>ACCEPTABLE GROUP SHIELD TERMINATION</b></p> <p>Shield ground leads shall be terminated to a common ground point. No more than 4 conductors, plus a drain wire, shall be terminated in a single splice.</p> <p><a href="#">NASA-STD-8739.4 [ 11.6 ]</a></p>

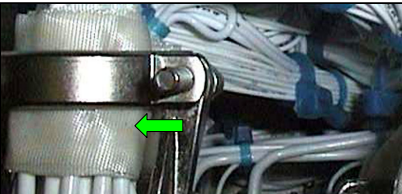
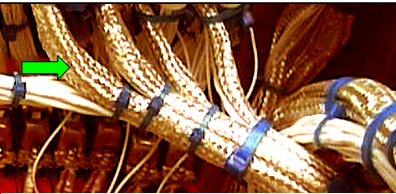

<p><b>UNACCEPTABLE DAISY-CHAIN GROUND TERMINATION</b></p> <p>Shield ground leads terminated in a daisy-chain configuration are susceptible to a single-point failure, should one of the links break.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.f.2 ]</a></p>

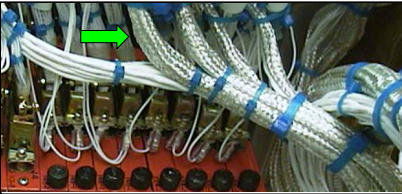
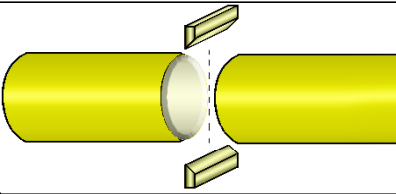

<p><b>ACCEPTABLE HEAT SHRINKABLE SLEEVING</b></p> <p>Sleeving shall be sized to provide a tight, smooth finish in the area of maximum diameter. Tubing shall be uniformly shrunk, without cracks, punctures, charred, burns, or wrinkles.</p> <p><a href="#">NASA-STD-8739.4 [ 9.8.1 ], [ 9.11 ], 19.6.1.e.13 ]</a></p>



<p><b>ACCEPTABLE HEAT SHRINK TUBING AS STRESS RELIEF</b></p> <p>The sleeving covers the termination and extends a minimum of 5 mm (0.20 in.) over the wire insulation. Tubing is fully shrunk, tight, and sufficiently rigid to provide stress relief and prevent flexure at the solder termination.</p> <p><a href="#">NASA-STD-8739.4 [ 9.9 ], [ Fig. A ]</a></p>

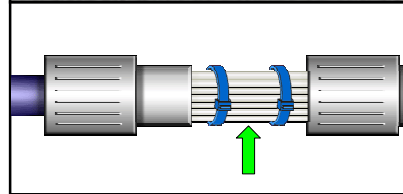
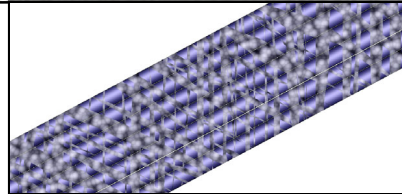
NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 04.05.2002	Revision:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 4	Section: 4.01
		Revision Date:	Page: 7

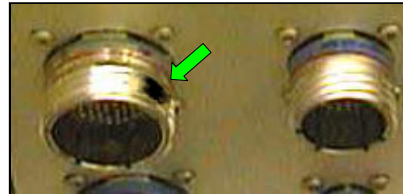
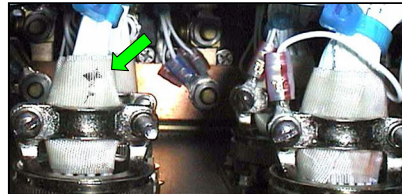
CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>ACCEPTABLE IDENTIFICATION</b></p> <p>Each cable / harness shall be identified by a permanent label / marking. Each connector shall be identified by a permanent label / marking affixed directly to the connector body, or to the cable adjacent to the connector.</p> <p><a href="#">NASA-STD-8739.4 [ 14.2.1. ], [ 14.2.2 ]</a></p>	<p><b>ACCEPTABLE IN-LINE SPLICE</b></p> <p>The splice exhibits a smooth profile, proper strain relief, and is located in an area of the harness not subjected to flexure.</p> <p><a href="#">Best Workmanship Practice</a></p>

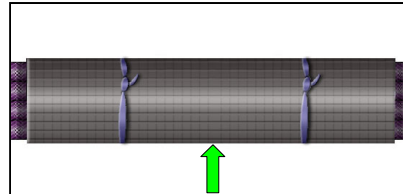
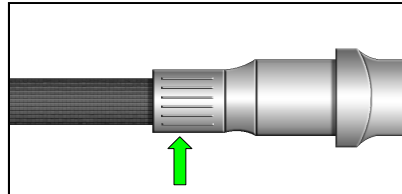
	
<p><b>ACCEPTABLE INSULATION WRAP</b></p> <p>Non-conductive tape / insulation wrap may be used in applications in which the use of heat-shrinkable tubing is impractical. Tape and wrapping materials shall be installed per engineering documentation.</p> <p><a href="#">Best Workmanship Practice</a></p>	<p><b>ACCEPTABLE METAL BRAID SLEEVING</b></p> <p>Metal braid sleeving may be installed over harnesses by either direct weave or by use of prewoven tubing. An insulation / separation layer shall be installed between the harness and the metal braid.</p> <p><a href="#">NASA-STD-8739.4 [ 9.7 ]</a></p>


	
<p><b>ACCEPTABLE OVERALL HARNESS SHIELDING</b></p> <p>An overall braided metallic shield provides mechanical and electrical protection (EMI/RFI) to the harness. Metallic shielding shall exhibit a smooth and tight finish, with a uniform distribution of coverage and no projecting strands.</p> <p><a href="#">NASA-STD-8739.4 [ 11.1.3 ]</a></p>	<p><b>ACCEPTABLE POLYIMIDE / NYLON BRAID SLEEVING HOT KNIFE SEALING</b></p> <p>Polyimide or nylon braids (for use on ground support equipment) may have their ends sealed by use of a "hot knife" or similar instrument.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3.4 ]</a></p>

NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 04.05.2002	Revision: Revision Date:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 4	Section: 4.01 Page: 8

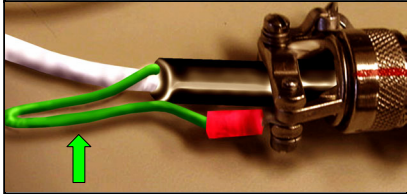
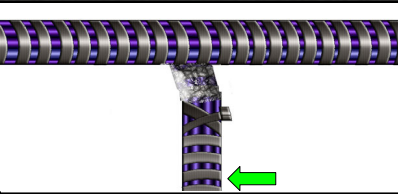
CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>ACCEPTABLE CONNECTOR SAVERS</b></p> <p>The use of connector savers is recommended. Connector savers shall meet the same requirements as a flight connector.</p> <p><a href="#">NASA-STD-8739.4 [ 17.2.7 ]</a></p>	<p><b>ACCEPTABLE DIRECT WEAVE FABRIC BRAID</b></p> <p>Fabric braids woven directly on interconnecting harnesses or cables may be loose or tight. The finish shall be smooth, without gaps in coverage, and without frayed ends.</p> <p><a href="#">NASA-STD-8739.4 [ 9.4 ]</a></p>

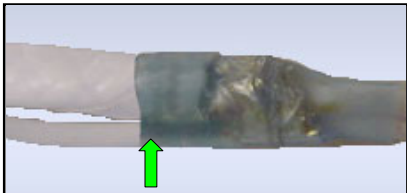
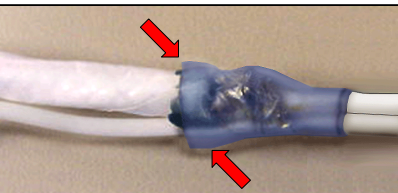
	
<p><b>ACCEPTABLE DISCOLORATION / SCUFFING CONNECTOR</b></p> <p>Slight scuffing or discoloration is acceptable, provided there is no impact to form, fit, or function, and there is no exposure of base metal.</p> <p><a href="#">Best Workmanship Practice</a></p>	<p><b>ACCEPTABLE DISCOLORATION / SCUFFING INSULATION</b></p> <p>The cable does not exhibit evidence of insulation damage, such as cuts, nicks, scrapes, crushing, cold flow, or burns. Slight scuffing or discoloration is acceptable.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.e.9 ]</a></p>

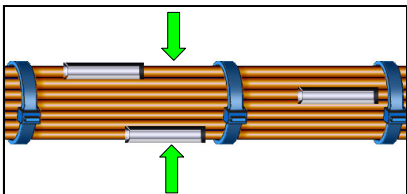
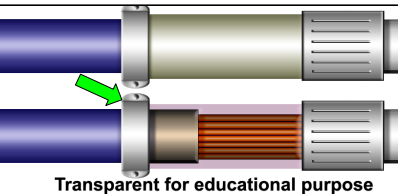
	
<p><b>ACCEPTABLE FABRIC BRAIDED SLEEVING</b></p> <p>Prewoven fabric (unvarnished) braid sleeving may be installed over the wire harness. Sleeving shall be snug, secured at both ends, and shall not slide freely. Ends shall be not be frayed or unraveled, and shall be tucked under.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3 ]</a></p>	<p><b>ACCEPTABLE FABRIC BRAID SLEEVING ALTERNATE END DRESS</b></p> <p>The end of the braid may be secured by connector clamps, other hardware, or potting.</p> <p><a href="#">NASA-STD-8739.4 [ 9.3.2 ]</a></p>

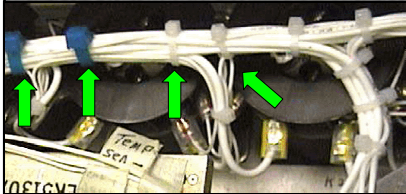
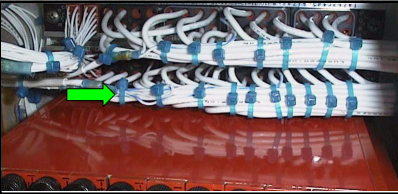
NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 04.05.2002	Revision: Revision Date:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 4	Section: 4.01 Page: 6

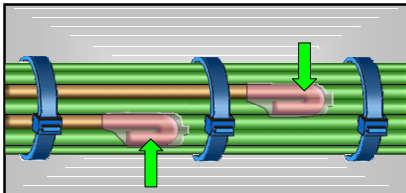
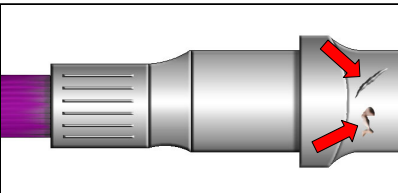


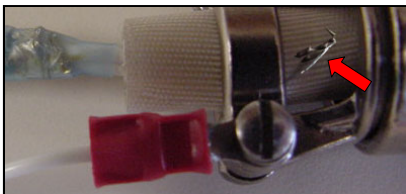
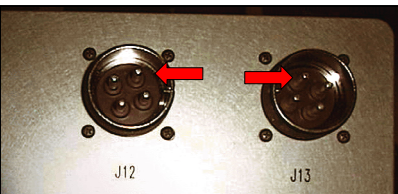
CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
 <p><b>ACCEPTABLE SHIELD / DRAIN WIRE</b></p> <p>The shield and drain wire have been properly terminated, per engineering documentation.  <a href="#">NASA-STD-8739.4 [ 19.6.1.f.2 ]</a></p>	 <p><b>ACCEPTABLE SPIRAL WRAP SLEEVING</b></p> <p>Spiral wrap shall be tight, uniformly spaced, and shall not overlap. Ends shall be trimmed to eliminate sharp edges.  <b>Note: Spiral wrap shall not be used on spacecraft or launch vehicles.</b>  <a href="#">NASA-STD-8739.4 [ 9.5 ]</a></p>

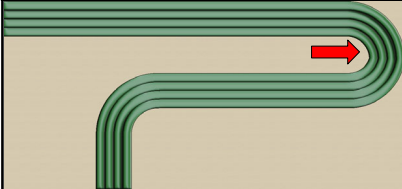
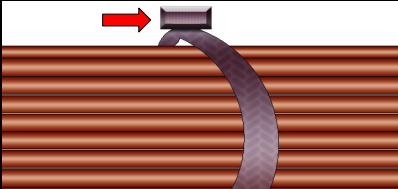
 <p><b>ACCEPTABLE SOLDER SLEEVE TERMINATION</b></p> <p>The solder sleeve has been properly installed and tightly shrunk. Strain relief is acceptable. Overlaps are of sufficient length to meet minimum electrical spacing. Solder fillet is visible, fully flowed, and smooth.  <a href="#">NASA-STD-8739.4 [ 11.4 ]</a></p>	 <p><b>UNACCEPTABLE SOLDER SLEEVE TERMINATION</b></p> <p>The solder sleeve has not been completely shrunk and is improperly positioned, resulting in a poor fit that does not provide a good mechanical grip or seal, and which does not meet minimum overlap requirements.  <a href="#">NASA-STD-8739.4 [ 9.8.1 ], [ 9.11 ]</a></p>
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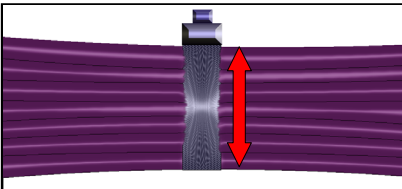
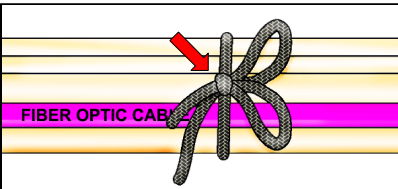
 <p><b>ACCEPTABLE SPLICE ASSEMBLY PROFILE</b></p> <p>The location of splices shall be staggered to minimize the increase in profile to the harness. Final assembly profile shall not impact form, fit, or function.  <a href="#">Best Workmanship Practice</a></p>	 <p><b>ACCEPTABLE STRAIN RELIEF</b></p> <p>The cable (shielded / unshielded) should be dressed to ensure that the strain relief mechanism transfers structural stresses from the connector to the cable sheath (or strength member) rather than to the individual conductors.  <a href="#">Best Workmanship Practice</a></p>
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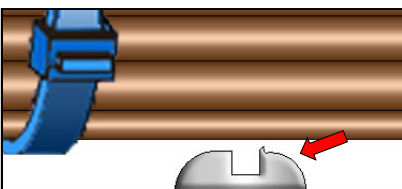
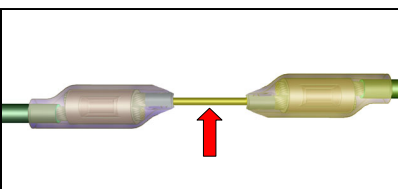
CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
 <p><b>ACCEPTABLE TIE / WRAP SPACING AT BREAKOUT</b></p> <p>Lacing or tie wraps have been placed on both sides of the harness breakouts. Ties are neat and tight.  <a href="#">NASA-STD-8739.4 [ 9.6 ]</a></p>	 <p><b>ACCEPTABLE UNIFORM CONDUCTOR TENSION</b></p> <p>The conductors exhibit uniform tension throughout the length of the harness. No bunching, bowing, looping, kinks, etc.  <a href="#">NASA-STD-8739.4 [ 19.6.1.e.3 ]</a></p>

 <p><b>ACCEPTABLE UNUSED / SPARE CONDUCTORS</b></p> <p>Unused or spare conductors shall be terminated by folding the unstripped end back on itself and then sealed with insulation sleeving or wrap. Conductor ends shall be secured to prevent unwanted movement, protrusion, or snagging.  <a href="#">NASA-STD-8739.4 [ 19.6.1.e.19 ]</a></p>	 <p><b>UNACCEPTABLE DAMAGE CONNECTOR</b></p> <p>Damage to the connector (i.e.: cuts, gouges, cracks, deformed features, bent pins, exposed base metal, etc.).  <a href="#">NASA-STD-8739.4 [ 19.6.1.e.1 ]</a></p>
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 <p><b>UNACCEPTABLE DAMAGE, INSULATION</b></p> <p>Damage to the cable jacket, ribbon, or conductor insulation (i.e.: cuts, pinching, nicks, scrapes, crazing, crushing, cold flow, exposed conductors, punctures, thinning, or burns).  <a href="#">NASA-STD-8739.4 [ 19.6.2.e.9 ]</a></p>	 <p><b>UNACCEPTABLE EXPOSED POWER CONTACTS</b></p> <p>Active signal / live voltages shall be confined to connectors with sockets to preclude the exposure of voltage points when the connector is disconnected.  <a href="#">NASA-STD-8739.4 [ 7.3.18 ]</a></p>
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CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>UNACCEPTABLE</b> <b>IMPROPER BEND RADIUS</b></p> <p>The harness exhibits a bend radius that is less than the minimum recommended for the conductor type(s) used and overall harness diameter.</p> <p><a href="#">NASA-STD-8739.4 [ 7.3.21 ]</a></p>	<p><b>UNACCEPTABLE</b> <b>IMPROPER CABLE TIE / WRAP TENSION</b></p> <p>Cable tie / wrap tension is too loose, allowing lateral movement along the cable bundle under normal handling.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.d.4 ]</a></p>

	
<p><b>UNACCEPTABLE</b> <b>IMPROPER CABLE TIE / WRAP TENSION</b></p> <p>Cable tie / wrap tension is too high, resulting in deformation and pinching of the wire insulation.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.d.3 ]</a></p>	<p><b>UNACCEPTABLE</b> <b>IMPROPER LACING KNOT</b></p> <p>The cable lacing has been secured with a bow-knot, rather than a square / non-slip knot. This tie may eventually loosen.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.d.4 ]</a></p>

	
<p><b>UNACCEPTABLE</b> <b>IMPROPER ROUTING</b></p> <p>Cables and harnesses shall be routed so that they are protected from abrasion, cold flow, cut through, vibration, chafing, flexing, and sharp edges.</p> <p><a href="#">NASA-STD-8739.4 [ 7.1.14 ]</a></p>	<p><b>UNACCEPTABLE</b> <b>IMPROPER SPLICING GAUGE / SIZE</b></p> <p>Replacement conductors shall be of the same voltage and current rating as the original conductor.</p> <p><a href="#">Best Workmanship Practice</a></p>

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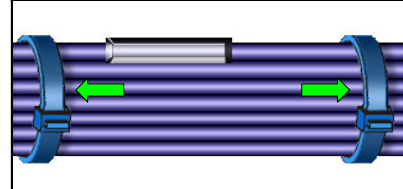
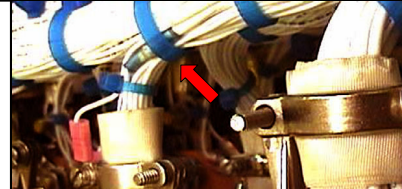
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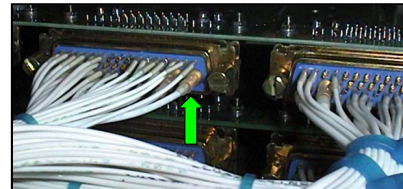

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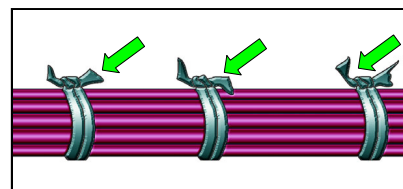
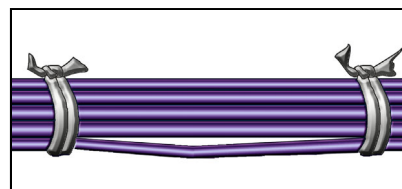
Book:  
4

Section:  
4.01

Page:  
12

CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)	
	
<p><b>ACCEPTABLE</b> <b>SPLICE / SOLDER SLEEVE RESTRAINT</b></p> <p>Cable ties / lacing shall be installed at both ends of a splice or solder sleeve, but placement shall not violate stress relief requirements.</p> <p><a href="#">Best Workmanship Practice</a></p>	<p><b>UNACCEPTABLE</b> <b>SPLICE / SOLDER SLEEVE RESTRAINT</b></p> <p>Cable ties / lacing shall not be installed across the splice / solder sleeve body, unless sufficient protection is provided to prevent compression damage to the termination and/or to the insulation of adjacent conductors.</p> <p><a href="#">Best Workmanship Practice</a></p>

	
<p><b>ACCEPTABLE</b> <b>STRESS RELIEF</b></p> <p>Wires exiting from the connector shall be stress relieved.</p> <p><a href="#">NASA-STD-8739.4 [ 7.3.22 ]</a></p>	<p><b>UNACCEPTABLE</b> <b>INSUFFICIENT STRESS RELIEF</b></p> <p>The placement of cable ties / straps shall not negate strain relief in cables or harnesses.</p> <p><a href="#">Best Workmanship Practice</a></p>

	
<p><b>ACCEPTABLE</b> <b>TIE / WRAP SPACING</b></p> <p>Ties are neat, tight, and properly spaced (relative to harness diameter) to maintain the wiring in a tight, neat bundle.</p> <p><a href="#">NASA-STD-8739.4 [ 9.2 ], [ 19.6.1.e.5 ]</a></p>	<p><b>UNACCEPTABLE</b> <b>INCORRECT TIE SPACING</b></p> <p>Cable ties / wraps have not been properly spaced relative to bundle / harness diameter.</p> <p><a href="#">NASA-STD-8739.4 [ 19.6.2.d.7 ]</a></p>

## NASA WORKMANSHIP STANDARDS



NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION  
  
JOHNSON SPACE CENTER  
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Released:  
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Revision:

Revision Date:

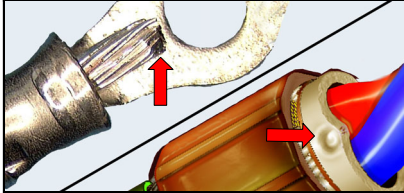
Book:  
4

Section:  
4.01

Page:  
10



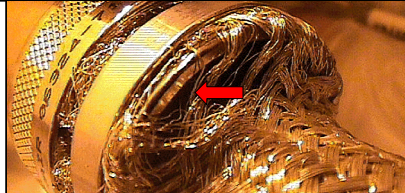
# CABLE AND HARNESS GENERAL REQUIREMENTS (cont.)



## UNACCEPTABLE IMPROPER TERMINATION

Solder and/or crimped terminations that do not meet the requirements of NASA-STD-8739.3 and/or NASA-STD-8739.4 shall be cause for rejection.

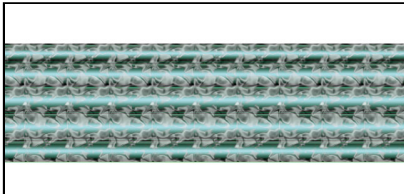
[NASA-STD-8739.4 \[ 13.1 \]](#)



## UNACCEPTABLE INCOMPLETE COVERAGE OF METAL BRAID

Metal braid sleeving shall exhibit uniform coverage, to provide electrical and mechanical protection to the underlying harness.

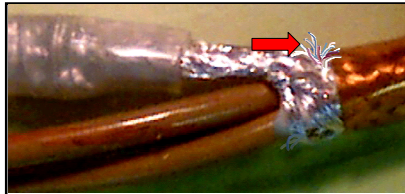
[NASA-STD-8739.4 \[ 19.6.2.b.8 \], \[ 19.6.2.e.5 \]](#)



## UNACCEPTABLE INCORRECT LACING MATERIAL

Waxed lacing shall not be used for spaceflight applications.

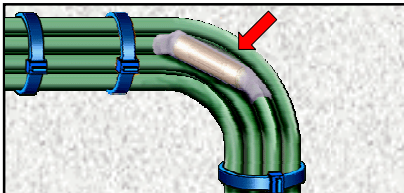
[NASA-STD-8739.4 \[ 19.6.2.d.2 \]](#)



## UNACCEPTABLE PROJECTING SHIELD STRANDS

The shield strands have been improperly dressed, resulting in projecting strands that may result in an electrical short or sharp object (puncture / snag) concern.

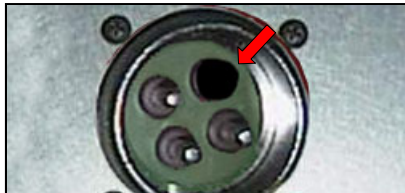
[Best Workmanship Practice](#)



## UNACCEPTABLE SPICES IN FLEXURE ZONE

Splices shall not be installed in areas where the harness is designed to flex.

[Best Workmanship Practice](#)



## UNACCEPTABLE UNSEALED ENVIRONMENTAL CONNECTOR

Sealing plugs or unused pins shall be installed in all unwired / unused holes to retain the environmental rating of the connector.

[NASA-STD-8739.4 \[ 7.3.19 \]](#)

## NASA WORKMANSHIP STANDARDS



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JOHNSON SPACE CENTER  
HOUSTON, TEXAS USA 77058

Released:  
04.05.2002

Revision:

Revision Date:

Book:

4

Section:

4.01

Page:

13

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